

New species of pseudoscorpions (Arachnida, Pseudoscorpiones: Chthoniidae, Chernetidae) from caves in China

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New species of pseudoscorpions (Arachnida, Pseudoscorpiones: Chthoniidae, Chernetidae) from caves in China. - Three new species are described and figured in the genus *Tyrannochthonius* J.C. Chamberlin (*akaelus* sp.n., *ganshuanensis* sp.n., *antridraconis* sp.n.), two species in the genus *Megachernes* Beier (*glandulosus* sp.n., *tuberosus* sp.n.) and one species of *Nudochernes* Beier (*troglobius* sp.n.). The affinities of these new taxa are discussed. They bring up to 13 the number of species currently recorded from caves in China, but this is certainly only a small proportion of the total number occurring in the numerous cave systems of this country.

Keywords: China - Sichuan - Hubei - biospeleology - Pseudoscorpiones - new species.

INTRODUCTION

Since 1992, seven speleological surveys of China have been carried out by the French Federation of Speleology (Aventures Karstiques Lointaines) in collaboration with the Institute of Technology Chengdu, China. The pseudoscorpions collected were sent to me by Mrs Josiane Lips (Lyon) (collections of 1992-1999, 2002-2006) and Dr Philippe Marti (Geneva) (collection of 2001). Schawaller (1995) mentioned three species from caves in his synopsis of Chinese pseudoscorpions, to which four new species were added by Mahnert (2003), all of which belonged to just two families, Neobisiidae and Chernetidae. The collections studied here add the first troglobiont species of Chthoniidae and further species of Chernetidae to the list. The species of the genera *Megachernes* and *Tyrannochthonius* recorded differ clearly from already known Asian species by certain morphological characters not yet recorded for these genera and underline our poor knowledge of the pseudoscorpions of the huge country of China in general and of its numerous caves in particular. Furthermore, the recent definition of the tribe Tyrannochthoniini proposed by Judson (2007) needs to be reconsidered due to the inconstancy of one important character (presence/absence of chemosensory setae on chelal hand) and the subsequent erection of the new tribe Ayyaloniini for a cave-dwelling species from Israel (Ćurčić, 2008). The presence of chemosensory setae is probably a synapomorphic character of Tyrannochthoniini (Judson, *loc. cit.*) but the number of these setae might have been reduced at least partially in some species groups (e.g. the Chinese species recorded here) or might be of value for splitting the highly diversified genus *Tyrannochthonius* into several groups.

Descriptions of the caves in which the new material was collected have been published by Degouve *et al.* (1997, 1999) and Lips (2006), who also provide the French and Chinese names and GPS data.

Terminology of trichobothria follows Harvey (1992), the term "rallum" (for flagellum) is adopted following Judson (2007).

Holotypes and paratypes of the new species are deposited in the Natural History Museum, Geneva, Switzerland, if not otherwise specified.

DESCRIPTIONS

Tyrannochthonius akaleus sp. n.

Figs 1-5

Pseudoscorpion troglobie. – Degouve *et al.*, 1997: p. 119, Fig.

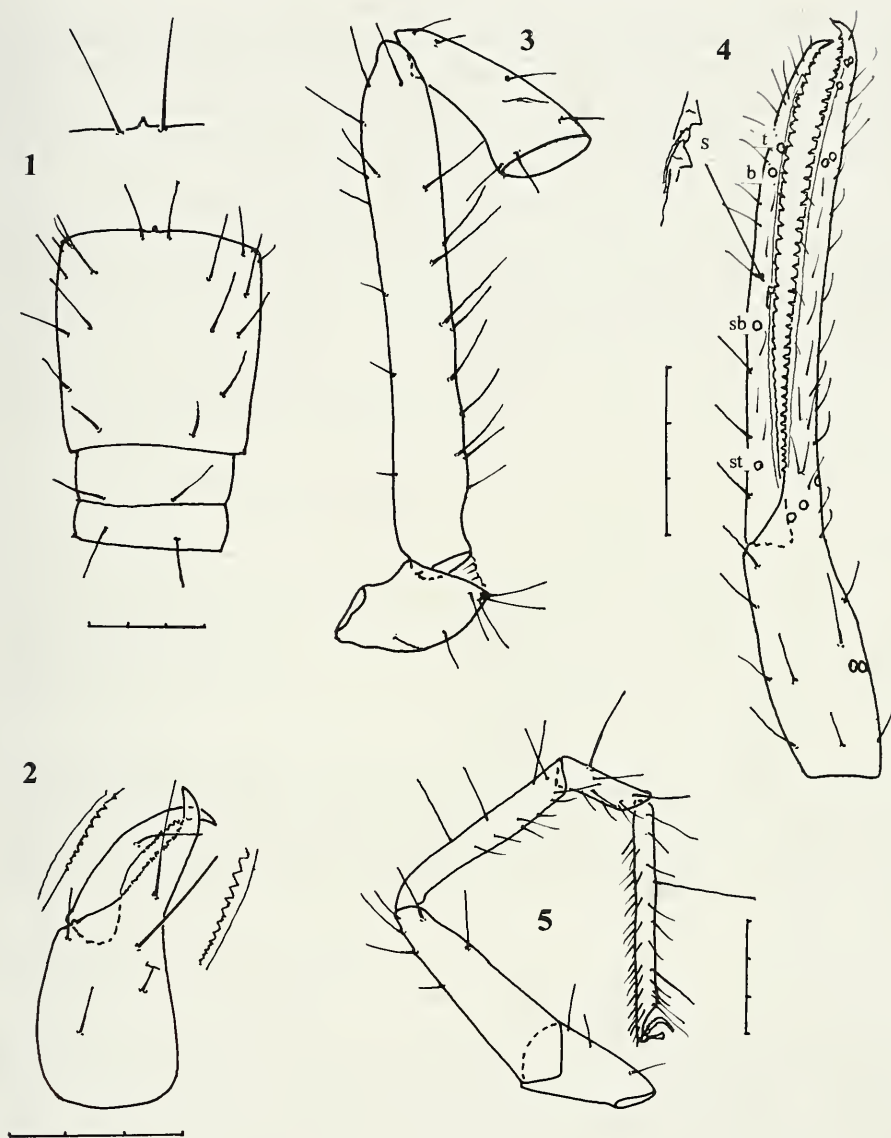
MATERIAL EXAMINED: China, Sichuan Province, Xin Long, bassin de la Source Noire, grotte du Passage (Chuan Dong Zi), alt. 1450 m, 24.8.1997, leg. J. Lips (no. 297): ♀ (holotype).

DIAGNOSIS: The new species is characterized by the following combination of characters: troglomorphic species with elongate appendages (chela in female 7.7 times longer than broad, length 1.28 mm); cephalothorax without eyes or eyespots; epistome small triangular; tergites I–II with 2 setae; intercalary teeth present on both chelal fingers, 9 on fixed finger between tip and marginal tooth distal of trichobothrium *it*, 8 on movable finger between tip and marginal tooth distal of trichobothrium *t*; sensillum at base of tooth distal of *sb*; lacking chemosensory setae on dorsum of chelal hand (but two of them being present near *eb*).

DESCRIPTION: Colour light yellowish, chelicerae brownish. Cephalothorax (Fig. 1) slightly longer than broad (1.06 times) and basally constricted, 18 setae, with 2 on posterior margin (6-4-4-2-2); epistome small triangular, one seta on each side clearly separated from its base; no eyes nor eyespots; chaetotaxy of tergites: 2-2-3-4-4-5-5-5-4-4 (2 submedian tactile setae). Manducatory process pointed, with 2 setae; coxae of pedipalps with 3 setae (2 marginal, 1 discal), coxa I 3, lateral process finger-like, II 4 + 11 dentate coxal spines placed in one row, III - IV 5 setae; intercoxal tubercle absent; genital operculum with 9 setae, chaetotaxy of sternites: 6 + 4 suprastigmatic microsetae on each side - 6 + 3 suprastigmatic microsetae - 10-8-9-9-9-7 (2 submedian tactile setae). Anal cone 0 dorsal/2 ventral setae. Pleural membrane striated, with microgranules.

Chelicera (Fig. 2): 5 setae on hand, fixed finger with 15 basally shorter teeth, movable finger with 12 small teeth of equal length; spinneret absent, serrula exterior with approximately 21 lamellae, rallum composed of 8 anteriorly dentate blades, the first three and the last not paired.

Pedipalp (Figs 3-4): Trochanter 2 times longer than broad, femur 6.6 times longer than broad, chaetotaxy: 5-6-2-6, patella 2.4 times, hand 2.5 times, finger 2.1 times longer than hand, chela 7.7 times longer than broad, no chemosensory setae on dorsum of hand, but two such setae present near *eb* (one slightly basal of *eb*, at the limit between hand dorsum and finger), no medial spine-like seta present on hand; fixed finger with 43 pointed teeth of equal length, intercalary teeth present between the first 9 marginal teeth; movable finger with 37 marginal teeth and intercalary teeth between the distal 8 teeth; marginal teeth in distal third pointed, becoming retrorse till tricho-



FIGS 1-5

Tyrannochthonius akaelus sp. n., ♀ holotype (1-5). (1) Cephalothorax and tergites I and II, with detail of epistomal region. (2) Left chelicera with detail of dentition (at higher magnification) of fingers. (3-4) Left pedipalp, with detail of sensillum (s) (higher magnification). (5) Leg IV. Scale units 0.1 mm.

bothrium *b*, from here to finger base lower, rounded and indistinct; one sensillum at base of marginal teeth distal of *sb*; base of movable finger unmodified. Trichobothrium *sb* indistinctly nearer *st* than *b*, *it/est* at level of *t*, line *eb-esb-ist* straight (Fig 4).

Leg I: Femur 7.8 times longer than deep and 2.1 times longer than patella, patella 3.9 times longer than deep, tibia 4.2 times, tarsus 10.0 times longer than deep and 2.06 times longer than tibia. Leg IV (Fig. 5): Femur+patella 4.2 times longer than deep, tibia 7.15 times longer than deep, basitarsus 3.4 times longer than deep, with one basal tactile seta (TS = 0.30), telotarsus 11.7 times longer than deep and 2.48 times longer than basitarsus, tactile seta in basal third (TS = 0.32).

MEASUREMENTS (length/width in mm): Total length 2.1; cephalothorax 0.55/0.52. Pedipalp: Trochanter 0.27/0.13, femur 0.90/0.14, patella 0.37/0.16, hand 0.42/0.17, length of finger 0.88, length of chela 1.28. Leg I: Femur 0.54/0.07, patella 0.26/0.07, tibia 0.25/0.06, tarsus 0.51/0.05; leg IV: Femur+patella 0.79/0.19, tibia 0.56/0.08, basitarsus 0.24/0.07, telotarsus 0.59/0.05.

ETYMOLOGY: Its name is a phonetic transcription of AKL, abbreviation for "Aventures Karstiques Lointaines", organiser of the speleological expeditions to China since 1992.

DISCUSSION: Affinities are discussed under the following species.

***Tyrannochthonius ganshuanensis* sp. n.**

Figs 6 - 8

MATERIAL EXAMINED: China, Sichuan, Xin Long, grotte de Gan Shuan, 30°38.96N/109°19.23 E, 6.8.1999, leg. J. Lips (no. 429): ♀ (holotype), 1 ♀ 1T (paratypes). – Xin Long, grotte du Poisson à Moustaches (Chang Chao Jia Dong), 30°33.497N/109°18.639E, 8.2.2004, leg. J. Lips (no. 1473): 1 ♀ (paratype) (Muséum national d'histoire naturelle, Paris MNHN Ps 146-01). – Hubei, commune Banqiao, grotte Tie He (grotte and perte de Tie He) 30°15.614N/109°37.423E, leg. J. Lips (2361): 1 ♂ (paratype).

DIAGNOSIS: Moderately sized troglomorphic species with elongate appendages (chela in female 6.9-7.3 times longer than broad, length 1.21-1.37 mm), without eyes or eyespots, tergites I/II (or III) with 2 setae; cephalothorax with 2 setae on posterior border, intercalary teeth present on both chelal fingers between finger tip and marginal teeth at level of trichobothrium *sb* (approximately tooth 18-20); lacking chemosensory setae on dorsum of chela hand, but two of them being present near trichobothrium *eb*.

DESCRIPTION: Yellowish, except chelicerae which are brownish. Cephalothorax shorter or longer than broad (0.90-1.04 times), not or slightly constricted posteriorly, epistome long and thin (1 ♂ broadly triangular, short), one seta near its base on each side; eyes or eyespots absent; with 18 setae (6-4-4-2-2), 2 on posterior margin, tergal chaetotaxy: 2/2/2-4/4/4/4-5/5/4-5/4 (2 submedian tactile setae). Manducatory process acute, with 2 bristles; coxae of pedipalps 3 setae (one discal), coxa I 3, lateral process finger-like, II 3-4, 10-12 deeply incised dentate coxal spines, placed in row (Fig. 6), III-IV 5 setae; anterior genital operculum with 9 setae; sternal chaetotaxy: 6 + 2x2-3 suprastigmatic microsetae/6+2x2-3/6-8/7-8/7-9/7-9/7-9/0. Anal cone 0 dorsal/2 ventral setae. Pleural membrane striate with tiny granules.

Chelicera: as in *T. akaelus*; serrula exterior 21–23 lamellae, spinneret absent;

Pedipalp (Figs 7-8): Trochanter 1.8 times longer than broad, femur 5.9-6.7 times (♂ 6.6 times) longer than broad, patella 2.2-2.4 times, hand 2.3 (♂: 2.6) times longer than broad, no medial strong longer seta near finger base, no chemosensory setae on dorsum, but two of them being present near *eb*; chela with pedicel 6.9-7.3

(δ : 7.9) times longer than broad; finger 2.0-2.2 times longer than hand; fixed finger with 36-40 pointed teeth, distinct and pointed intercalary teeth present from tip to nearly level of *sb*, movable finger with unmodified base, with 35-38 teeth, slightly retrorse in distal third, basal of *sb* flattening and rounded rudiments, intercalary teeth present near to *sb*; sensillum near trichobothrium *sb*. Trichobothrial pattern as in Fig. 8: *sb* slightly nearer *b* than *st*; line *eb-esb-ist* with slight angle.

Leg I: Femur 6.9-7.3 (δ : 8.0) times longer than deep and 2.06-2.25 times longer than patella, patella 3.6-4.3 times longer than deep, tibia 3.9-4.3 times, tarsus 9.7-11.0 times longer than deep and 2.18-2.28 times longer than tibia. Leg IV: femur+patella 3.7-4.1 times longer than deep, tibia 6.1-6.8 times longer than deep, with a pseudo-tactile seta in basal third, basitarsus 3.1-3.5 times longer than deep, with a basal tactile seta (TS = 0.27-0.34), telotarsus 11.3-12.6 times longer than deep and 2.57-2.71 longer than basitarsus, a tactile seta in distal third (TS = 0.31-0.41).

MEASUREMENTS (in mm): Total length 1.4-1.8; cephalothorax 0.51-0.54/0.50-0.54; Pedipalps: Trochanter 0.26-0.29/0.15-0.16, femur 0.95-0.97/0.13-0.16, patella 0.34-0.39/0.15-0.18, hand 0.38-0.45/0.17-0.19, length of fixed finger 0.84-0.98, length of movable finger 0.83-0.93, length of chela 1.21-1.44. Leg I: Femur 0.52-0.58/0.07-0.08, patella 0.23-0.27/0.06-0.07, tibia 0.22-0.25/0.06, tarsus 0.49-0.56/0.05; leg IV: Femur+patella 0.75-0.83/0.20, tibia 0.52-0.58/0.08-0.09, basitarsus 0.22-0.25/0.07, telotarsus 0.58-0.64/0.05.

ETYMOLOGY: The name derives from the Chinese name of the cave (Gan Shuan).

DISCUSSION: *Tyrannochthonius ganshuarensis* sp.n. shares with *akaelus* sp.n. the same tergal chaetotaxy (only two setae on the anterior tergites), but differs from it by the more numerous and more distinct intercalary teeth, slightly more distal position of *ist* compared to *eb-esb* (line with angle), and (at least in female) by a slightly stouter chela (hand 2.3 times vs 2.5 times, chela 6.9-7.3 times vs 7.7 times longer than broad).

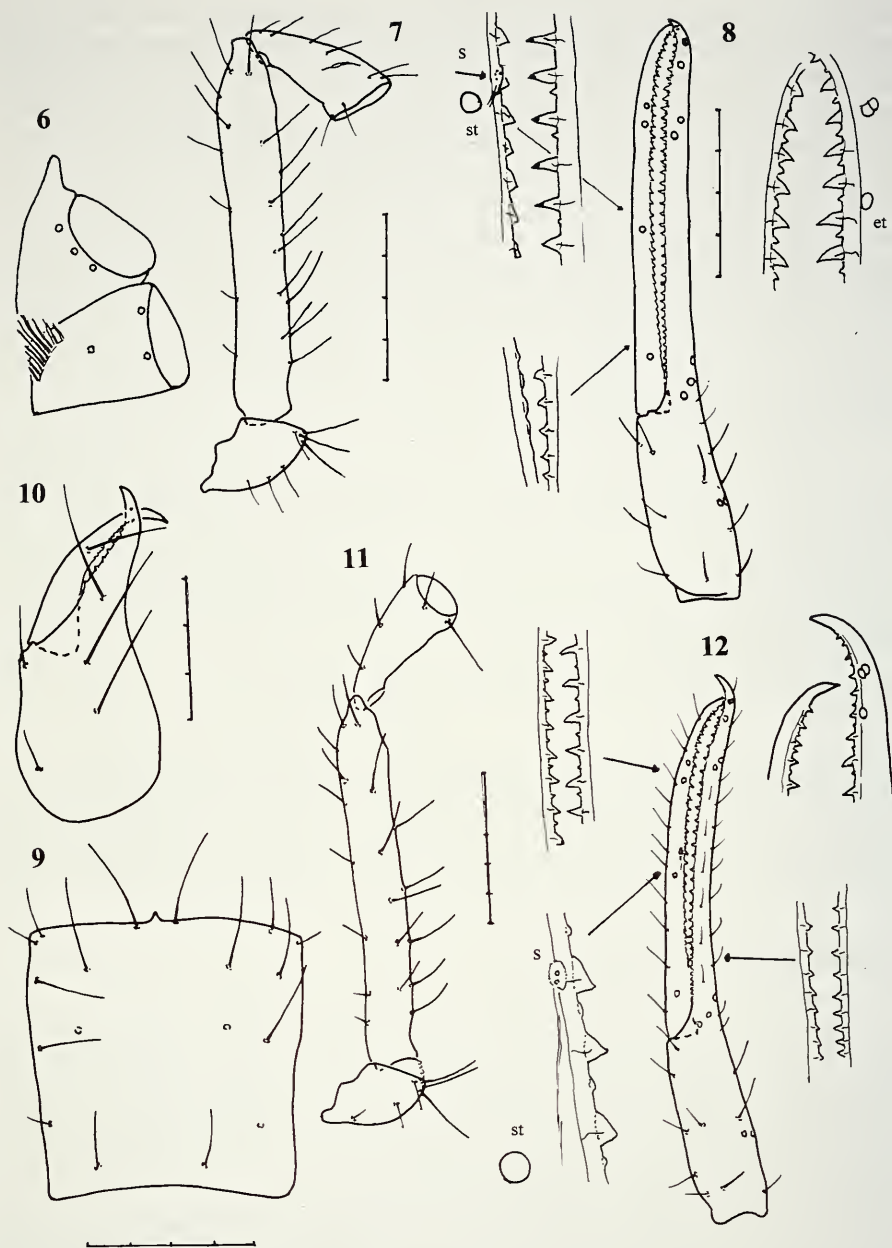
Tyrannochthonius antridraconis sp. n.

Figs 9-12

Pseudoscorpion troglobie. – Degouve *et al.*, 1997: p. 115, Figs.

MATERIAL EXAMINED: China, Sichuan Province, Xin Long, bassin de la Source Noire, grotte "Perte du Dragon", alt. 1470 m, 23.8.1997, leg. J. Lips (no.255): δ (holotype). – Xin Long, bassin de la Source Noire, grotte du Dragon (Long Qiao Dong), 30°94'N /109°21.16'E, 22.8.1997, leg. J. Lips (no. 245): 1 ♀ (paratype). – Xin Long, gouffre de la Bouche du Serpent (Shekon Tian Ken), NE of Han Re Ba, 5.8.1999, leg. J. Lips (no.404): 1 ♀ (paratype). – Xin Long, grotte du Poisson à Moustaches (Chang Chao Jia Dong), 30°33.39'N/109°18.639'E, 8.2.2004, leg. J. Lips (no. 1473): 1 ♂ (paratype).

DIAGNOSIS: Troglotic species of relatively large size and elongate appendages (length of palpal femur 1.18-1.29 mm, length of chela 1.68-1.76 mm), cephalothorax without eyes or eyespots, 2 setae on posterior border, epistome broad, triangular; first tergites with four setae; one slightly longer seta on medial distal face of hand, lacking chemosensory setae on dorsum of hand, but two of them being present near trichobothrium *eb*; chelal finger with intercalary teeth between the marginal teeth, on fixed finger on the distal 2/3 of finger, on movable finger reaching to near *sb*.



FIGS 6-12

Tyrannochthonius ganshuarensis sp. n., ♀ holotype (6-8). (6) Left coxa I and II. (7-8) Left pedipalp, with details of dentition (higher magnification) of chelal fingers and sensillum (s). Scale units 0.1 mm. — *Tyrannochthonius antridraconis* sp. n., ♂ holotype (9-12). (9) Cephalothorax. (10) Left chelicera. (11-12) Left pedipalp, with details of dentition and sensillum (s) (higher magnification). Scale units 0.1 mm.

DESCRIPTION: Colour whitish yellow, chelicerae light brown. Cephalothorax (Fig. 9) as long as broad (0.97-1.06 times), eyes or eyespots absent; 18 setae in total, 2 on posterior margin (6-4-4-2-2) (in one ♀ 2 preocular setae present instead of 1), epistome distinct, triangular; tergal chaetotaxy: I-VII 4, VIII 5-6, IX 5 (2 longer setae), X 4-5 (2 longer setae), XI 6 (2 submedian tactile setae). Manducatory process pointed, with 2 marginal setae; coxae of pedipalps 3 setae (one discal), coxa I 3, lateral process short, finger-like, II 3 + 12-15 dentate coxal spines, arranged in one row, III-IV 5, intercoxal tubercle absent; anterior genital operculum 9-10 setae, male genital opening small slit-like in the basal 2/3, 6 marginal setae on each side, distal margin finely dentate; sternal chaetotaxy: 6-8 + 2-4 microchaetae on each stigma/6-8 + 2-3/9-10/7-9/8-10/8-9/8-9 (2 submedian tactile setae)/6-9 (2 tactile setae). Anal cone 0/2 setae. Pleural membrane striate, with tiny granules. Chelicera (Fig. 10): 5 setae on hand, fixed finger with about 12-14 small pointed teeth, some distal ones slightly enlarged, movable finger with 11-13 small, pointed teeth of equal length, spinneret absent, serrula exterior with 22-26 lamellae, rallum composed of 8 serrate blades, four of them arranged in two pairs.

Pedipalp (Figs 11-12): Trochanter 1.7-1.8 times longer than broad, femur 7.3-8.3 (♂)/7.1-7.5 (♀) times longer than broad, patella 2.2-2.6 times, hand 2.5-2.7 times longer than broad, without chemosensory setae on dorsum, but two of them being present near trichobothrium *eb*, an indistinct groove basal of *ib/isb*, no strong longer seta on medial face near finger base; chela 7.9-8.0 (♂)/6.9-7.55 (♀) times longer than broad, finger 1.90-2.04 times longer than hand, basal apodeme of movable finger quite simple; fixed finger with 33-36 cusped teeth, rounded and partly indistinct intercalary present in the distal 2/3 of the finger; 6 basal marginal teeth smaller and less spaced; movable finger with 30-36 cusped slightly retrorse teeth (flattened and rounded in basal third), intercalary teeth distinct, some half of length of marginal teeth, till trichobothrium *sb*; sensillum at base of 3rd tooth distal of *sb*. Trichobothrial pattern see Fig. 12: *sb* slightly nearer *b* than *st*; line *eb-esb-ist* straight (or nearly so).

Leg I: Femur 7.7-9.4 times longer than deep and 2.09-2.27 times longer than patella, patella 4.0-4.3 times longer than deep, tibia 4.3-4.9 times, tarsus 10.1-11.3 times longer than deep and 2.16-2.32 times longer than tibia. Leg IV: Femur+patella 4.3-4.7 times longer than deep, tibia 6.7-7.3 times longer than deep, basitarsus 3.3-4.2 times longer than deep, with a basal tactile seta (TS = 0.30-0.36), telotarsus 12.0-13.7 times longer than deep and 2.3-2.8 times longer than basitarsus, tactile seta in basal third (TS = 0.31-0.36); arolia undivided, half as long as the smooth and slender claws.

MEASUREMENTS (length/width in mm): Total length 1.8-2.3; cephalothorax 0.61-0.68/0.62-0.64. Pedipalp: Trochanter 0.33-0.35/0.19-0.20, femur 1.18-1.29/0.16-0.17, patella 0.45-0.49/0.19-0.20, hand 0.50-0.60/0.22-0.24, length of fixed finger 1.15-1.20, of movable finger 1.07-1.13, length of chela 1.70-1.76 (♂)/1.68-1.70 (♀). Leg I: Femur 0.72-0.79/0.08-0.09, patella 0.32-0.36/0.08-0.09, tibia 0.32-0.33/0.07-0.08, tarsus 0.70-0.76/0.07; leg IV: Femur+patella 1.04-1.13/0.23-0.25, tibia 0.70-0.79/0.10-0.11, basitarsus 0.30-0.34/0.08-0.10, telotarsus 0.79-0.88/0.0-0.07.

ETYMOLOGY: The name derives from the Latin name of the cave (*antrum draconis*) (cave of the dragon).

DISCUSSION: This taxon is distinguished from the two previously described species *Tyrannochthonius acaelus* n.sp. and *T. ganshuanensis* n.sp. by the tergal chaetotaxy (anterior tergites with 4 marginal setae) and larger size (length of palpal femur min. 1.18 mm vs max. 0.97 mm; length of chela min. 1.68 mm vs max. 1.44 mm).

Forty-eight cave-dwelling and anophthalmous species of Tyrannochthoniini (genera *Tyrannochthonius*, *Lagynochthonius* and *Paraliochthonius*) have been recorded, mainly from the USA and Australia, but also from Jamaica, Spain (mainland and Canary Islands), Portugal and New Zealand (Edward & Harvey, 2008), one *Lagynochthonius* species is known from continental Asia (Vietnam: Judson, 2007), but none has previously been recorded from China. The taxon *Ayyalonia dimentmani* Ćurčić, 2008, type genus of the tribe Ayyaloniini Ćurčić, 2008, has been described from caves in Israel, but its status should be reconsidered based on richer material, since no convincing differences seem to exist between this genus and tribe and *Tyrannochthonius* and Tyrannochthoniini.

Three epigeal species of *Tyrannochthonius* are known from China (*japonicus* Ellingsen, *pachythorax* Redikorzev, *robustus* Beier) (Schawaller, 1995), but all of them possess 4 setae on the anterior tergites and are described as having a different dentition of the fixed cheliceral finger (distal submedian tooth large). The three taxa described here probably form an endemic group of species sharing, beside the troglobitic adaptations, the following characters: the nearly uniform dentition of cheliceral fingers (particularly of the fixed one), chelal hand without an medial spine-like seta near finger; base of movable chelal finger nearly unmodified, without a strong internal apodeme, absence of chemosensory setae on dorsum of chelal hand (a character considered by Judson, 2007 as a synapomorphy of the tribe Tyrannochthoniini) but two of them being present near trichobothrium *eb*. The reduction of this series of chemosensory setae on dorsum of chelal hand might be helpful in defining species groups within this highly diversified genus since Australian species seem to present also a reduced number of these chemosensory setae (Edwards & Harvey, 2008). *Tyrannochthonius* species from other countries of continental Asia are easily distinguished from the three Chinese species by their smaller size, stouter pedipalps, the presence of 2 or 4 eyes, the chaetotaxy of abdominal tergites and other morphological characters.

Tyrannochthonius sp.

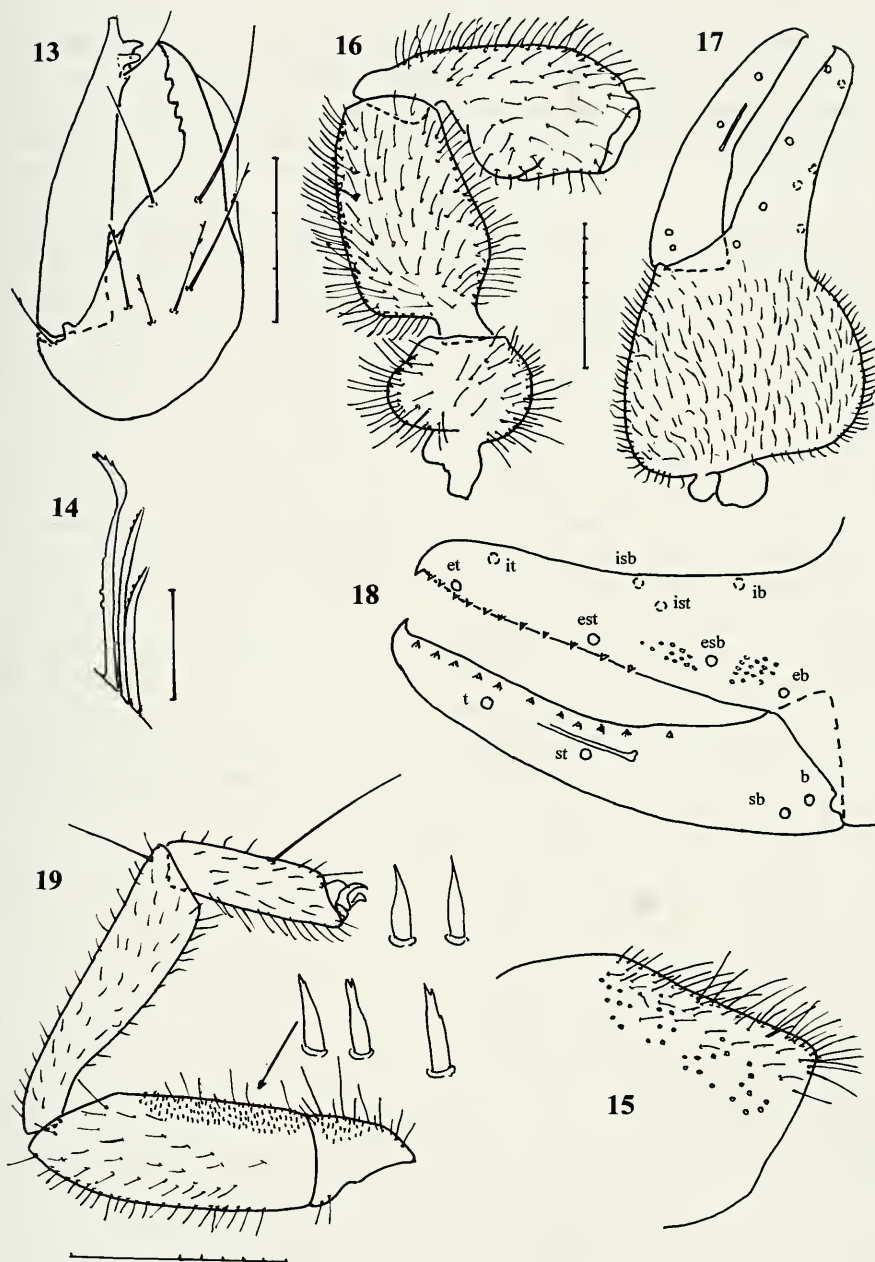
MATERIAL EXAMINED: China, Sichuan, Xin Long, grotte Lei Da Bae, 19.8.1997, leg. J. Lips (no. 223): 1 deutonymph.

Megachernes glandulosus sp. n.

Figs 13-19

MATERIAL EXAMINED: China, Hubei, Banqiao, grotte Xiao Dong, 30°35.13'N/109°15.727'E, 3.8.2006, leg. J. Lips (no. 2238): ♂ (holotype).

DIAGNOSIS: A species of the genus *Megachernes* characterized by very stout pedipalps (femur 1.85 times longer than broad), a prominent median hump on palpal patella, the presence of numerous, densely-set, long ("fur-like") setae on femur and patella, presence of normal setae on cephalothorax, the presence of numerous glandular(?) pores on coxae, half-sternites IV-IX and on basal lateral face of fixed chelal finger, and the presence of numerous glandular(?) microsetae on ventral side of femur and patella of legs III and IV.



FIGS 13-19

Megachernes glandulosus sp. n., ♂ holotype (13-19). (13) Left chelicera. (14) Rallum. (15) Posterior margin of coxa IV. (16-17) Left pedipalp. (18) Trichobothrial pattern. (19) Leg IV, with details of the glandular(?) microsetae (higher magnification). Scale units 0.1 mm.

DESCRIPTION: Cephalothorax and pedipalps dark reddish, tergites and sternites brown, inner third of half-tergites with a dark spot. Cephalothorax broader than long (1.1 times), without eyes or eyespots, two distinct and granulate transverse furrows, the subbasal one slightly nearer to median furrow than to posterior border, median part of cephalothorax smooth, the prozone and lateral zones indistinctly scaly sculptured, metazone with a small longitudinal groove and numerous sensory (or glandular?) pores; numerous short acute setae, about 12 on anterior and about 16 on posterior border; tergites distinctly divided, ctenoid-scaly sculptured, all half-tergites with field of pores along the posterior border (these zones smooth), lateral margins not modified, with about 10-15 marginal setae, 3-6 lateral and 1-2 median anterior setae, seta short, acute or finely dentate apically, half-tergite X with one median discal tactile seta, tergite XI with 45 setae (6 tactile setae). Manducatory process with 4 marginal setae (suboral seta short) and 5 discal ones; pedipalpal coxa nearly smooth, with numerous long acute setae, coxa I about 20 setae and numerous pores, II about 30 setae/numerous pores, III about 40 setae/numerous pores, IV numerous setae and pores, lateral hind-corner moderately elongate, with densely set, long setae (Fig. 15); anterior genital operculum with numerous short, acute and curved setae; tergite III with numerous short smooth discal setae behind the genital opening. Sternites IV-XI divided, scaly-ctenoid sculptured, half-sternites IV-IX each with smooth triangular fields of sensory (or glandular?) pores along hind margin, X/XI scaly sculptured, about 8-10 supra-stigmatic microchaetae; half-sternites with about 11-14 marginal setae, 1 lateral and 1 median anterior seta; setae acute and of moderate length; anal cone 2/2 setae. Chelicera (Figs 13-14): 7 setae on hand, the basal five finely dentate apically, fixed finger with 4 large retrorse teeth, movable finger with a long broadly rounded subapical lobe, spinneret on left chelicera broken, on right chelicera short and apically forked, rallum with 3 setae, with knob-like protuberances on anterior side, apical part of distal seta slightly enlarged and twisted, serrula exterior 27 lamellae.

Pedipalp (Figs 16-18): Trochanter, femur and patella densely and finely granulate, with numerous long and densely-set acute setae ("fur-like" setation), between them on medial face of femur and patella numerous short and apically dentate setae; hand finely granulate, with dense and short setation, fixed finger in basal half with fields of pores on lateral face; trochanter with high and broad dorsal hump, femur abruptly enlarged at base, distally narrowing, 1.85 times longer than broad, patella with a distinct rounded protuberance on median side, 2.0 times longer than broad, club 1.4 times longer than broad and 2.25 times longer than pedicel, hand with pedicel 1.06 times longer than deep and about 1.7 times longer than broad, chela with pedicel 2.2 times, without pedicel 2.1 times longer than deep and with/without pedicel about 3.5 times longer than broad; chelal finger longer than hand with pedicel, distinctly gaping, fixed finger with 59 small cusped marginal teeth, 11 lateral and 18 medial accessory teeth, movable finger with 67 cusped marginal teeth, 11 lateral and 15 medial accessory teeth, the medial ones partly arranged in 2 or 3 irregular rows; venom duct long, nodus ramosus basal of *st*. Trichobothrial pattern (Fig. 18): *st* nearer to *t* than to *sb*; *ist* close to *ish*, halfway between *ib* and *est* and distinctly distal of *esb*.

Leg I: Femur 1.4 times longer than deep, patella 2.7 times longer than deep and 1.7 times longer than femur, tibia 3.1 times longer than deep and 1.35 times longer than

tarsus, tarsus 3.2 times longer than deep; leg IV (Fig. 19): trochanter, femur and patella with large fields of glandular(?) microsetae along lower margin; femur with a few long setae, patella, tibia and tarsus with numerous mostly short and finely dentate setae; femur+patella 3.6 times longer than deep, tibia 4.4 times longer than deep and 1.7 times longer than tarsus, with a tactile setae near apex (TS = 0.93), tarsus 3.5 times longer than deep, tactile seta in middle (TS = 0.55), arolia shorter than the broad and smooth claws, subterminal seta smooth and curved.

MEASUREMENTS (length/width in mm): Total length 5.3; cephalothorax 2.08/1.87; pedipalp: Trochanter 1.10/0.93; femur 1.71/0.92, patella 1.84/0.90, pedicel 0.57, hand (length/depth) 1.64/1.54, length of movable finger 1.80, of chela with pedicel 3.44, without pedicel 3.19; leg I: femur 0.53/0.38, patella 0.89/0.33, tibia 0.81/0.26, tarsus 0.60/0.19; leg IV: femur+patella 1.72/0.48, tibia 1.44/0.32, tarsus 0.84/0.24.

ETYMOLOGY: a Latin adjective, meaning rich with glands.

DISCUSSION: Species of the genus *Megachernes* are associated with nests of small mammals and are perhaps also guanophilous. Twenty-three species and subspecies are described from the Asian and Australian regions, of which half are distributed in continental Asia (Schawaller, 1991, 1994). Three (or four) are recorded from the Chinese Republic (Schawaller, 1995, Harvey, 2008), most specimens having been collected in caves: *himalayensis* (Ellingsen, 1914) (Sichuan prov.) and cf. *himalayensis* (Ell.) (Guanxi prov.), cf. *titanius* Beier, 1951 (Yunnan prov.) and cf. *vietnamensis* Beier, 1967 (Hubei and Sichuan prov.).

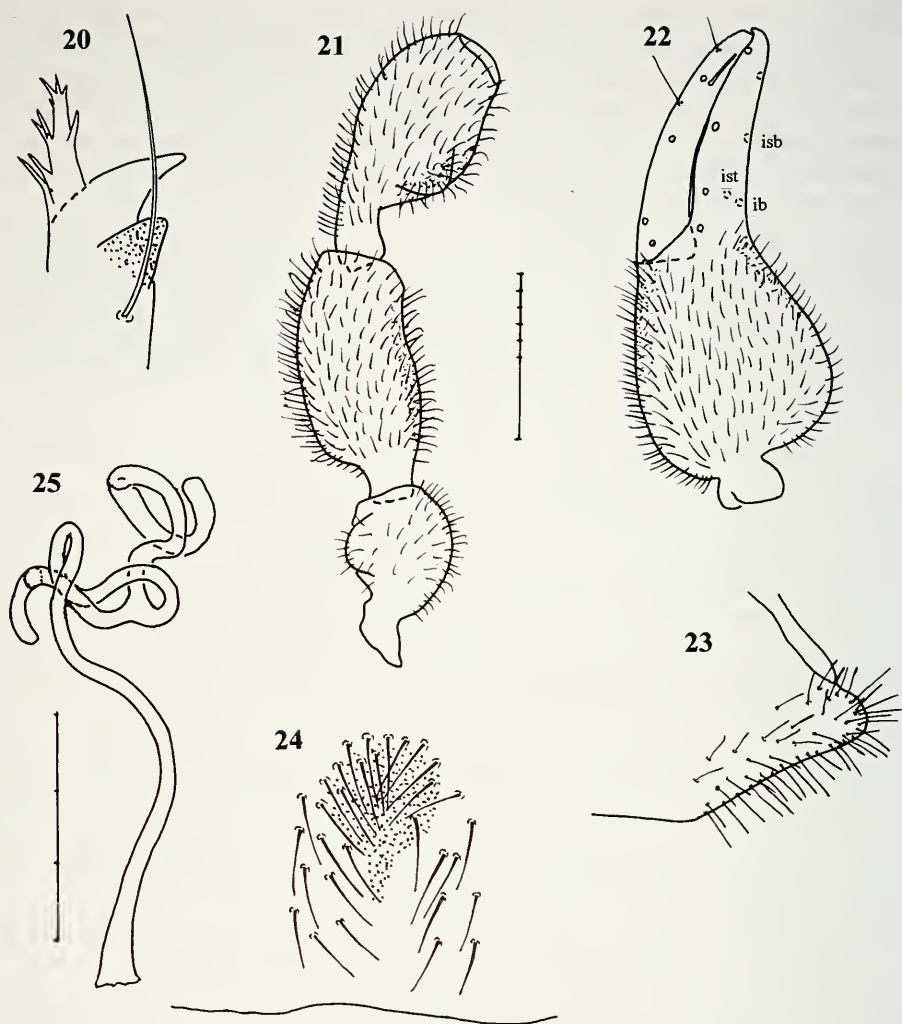
Only a few of the described *Megachernes* species show a sexual dimorphism or "fur-like" (hirsute) setation on pedipalps and/or cephalothorax and only four of these are found in continental Asia (*M. afghanicus* Beier, 1959; *M. barbatus* Beier, 1951; *M. loebli* Schawaller, 1991 and *M. trautneri* Schawaller, 1994). None of those species is recorded as having a prominent protuberance of the palpal patella (at least in the male) or having glandular(?) setae on the legs, coxae and abdominal segments. Furthermore *Megachernes loebli* (from Nepal) and *M. trautneri* (from Thailand) are easily distinguished by their smaller size (length of palpal femur max. 1.53mm vs 1.71mm). *M. barbatus* from Vietnam is similar in size (femur length 1.72-1.90 mm: ♂ ♀), and also has "fur-like" setation on palpal segments (in both sexes), gaping chelal fingers in the male and a similar trichobothrial pattern (*ist/isb* near to *est* and distinctly distal of *esb*) (Beier, 1951), but it differs from *glandulosus* sp.n. by its more slender palpal segments (e.g. femur in male 2.2-2.4 times longer than broad), the absence of a protuberance on the male patella (even if Fig. 17 in Beier, 1967 suggests a sexual dimorphism), the absence of glandular structures and the presence of a "fur-like" setation of the cephalothorax in both sexes.

The presence of a protuberance on the male palpal patella is a supplementary sexual dimorphic character in this genus, but it seems to be quite variable and more or less pronounced depending on the size of the male.

Megachernes tuberosus sp. n.

Figs 20-25

MATERIAL EXAMINED: China, Sichuan, Tong Jian, grotte de la Montagne (Gao Feng Dong), near Zhong Fong Dong, 32°27.53'N/107°10.81'E, alt. 1000m, 13.8.2004, leg. F. Schalke (no. 1542): ♂ (holotype), 1♂, 2♀ (paratypes).



FIGS 20-25

Megachernes tuberosus sp. n., ♂ holotype. (20) End of movable cheliceral finger. (21-22) Left pedipalp. (23-25) ♀ paratype. (23) Posterior margin of left coxa IV. (24) Genital operculum. (25) Spermatheca. Scale units 0.1mm.

DIAGNOSIS: A large species of *Megachernes* (length of pedipalpal femur 1.18-1.50mm) with a long "fur-like" setation on palpal femur and patella, but not on cephalothorax, relatively slender pedipalps (femur 2.2-2.4 times longer than broad), with a more or less distinct protuberance on male palpal patella, non-gaping chelal fingers and with trichobothrium *ist* in basal position near *ib* and at level of *esb*, distinctly separated from *isb*, which is at level of *est*, and indistinctly reinforced medial and lateral margins of half-tergites.

DESCRIPTION: Cephalothorax and pedipalps reddish brown, tergites brown. Cephalothorax broader than long (♀: 0.8 times) or as long as broad (♂: 0.98-1.01 times), without eyes or eyespots, indistinctly sculptured ("paving-stones"), setae short and finely dentate apically; two distinct granulate traverse furrows, metazone with a small longitudinal groove, about 10-12 setae on anterior and 11-15 on posterior margin (the lateral ones shorter and thicker); all tergites distinctly divided, scaly sculptured, small fields with pores along the posterior margin; setae short, apically dentate, the lateral and median borders of half-tergites indistinctly reinforced; half-tergites with about 8-11 marginal setae, 1-4 lateral and one medial anterior setae, tergite XI with 14-16 setae (4 tactile setae). Manducatory process with 3 marginal setae (1 microchaeta) and 4-5 discal ones; pedipalpal coxa granulate laterally, with numerous setae, coxa I-IV with numerous short apically dentate setae, lateral hind corner of coxa IV (Fig. 23) moderately elongate, with numerous longer setae; anterior genital operculum of male with numerous setae arranged in several rows, the internal setae long and curved, that of female (Fig. 24) with about 26 setae arranged in two rows, spermatheca (Fig. 25) with a long, thin, central tube dividing into two, short, coiled and thin tubes. Sternites divided, half-sternites with fields of pores along posterior margin, otherwise scaly sculptured; sternite III with numerous (♂) or 6 (♀) marginal setae and 4-6 suprastigmatic microchaetae, half-sternite IV 8-11 marginal setae and 5-8 suprastigmatic microchaetae, the following half-sternites with about 11-17 marginal setae, one medial and 1-2 lateral anterior setae, sternite XI 10-24 setae (4 tactile setae); anal cone with 2+2 setae. Chelicera: 7 setae on hand, five basal ones finely dentate, fixed finger with 4-6 retrorse teeth and 2-3 apical granules, movable finger with a long, tooth-like sub-apical lobe, galea relatively short, with 6-7 branchelets (Fig. 20), serrula exterior 28-33 lamellae, rallum of 3 setae, scarcely dentate anteriorly, the apex of the first one slightly twisted.

Pedipalp (Figs 21-22): Long ("fur-like") setae on trochanter, femur and patella, numerous shorter setae on hand, all finely granulate; trochanter with a large and distinct dorsal protuberance, 1.4-1.7 times longer than broad, femur 2.2-2.4 times, patella 2.1-2.2 times longer than broad, with a more or less pronounced protuberance in males only, club 1.5-1.6 times longer than broad, hand with pedicel 1.4-1.6 times longer than broad, chela with pedicel 2.7-3.0 times longer than broad; finger as long as hand with pedicel, not gaping, fixed finger with 62-63 cusped marginal teeth, 10-13 lateral and 10-16 medial accessory teeth, movable finger with 60-66 marginal teeth, 11-14 lateral and 8-11 medial accessory teeth (arranged in 2-3 irregular rows on both fingers); venom duct short, nodus ramosus at level of trichobothrium *t*. Trichobothrial pattern (Fig. 22): *st* on movable finger only slightly nearer *t* than *sb*; on fixed finger *isb* nearly at level of *est*, *ist/ib/lesb* forming a basal group.

Leg I: Femur 1.6-1.7 times longer than deep, patella 3.0-3.2 times longer than deep and 1.6-1.7 times longer than femur, tibia 4.1-5.0 times longer than deep and 1.3-1.4 times longer than tarsus, tarsus 4.1-4.6 times longer than deep. Leg IV: Femur+patella 4.1-4.6 times longer than deep, tibia 5.5-6.0 times longer than deep and 1.6-1.7 times longer than tarsus, tarsus 4.6-5.1 times longer than deep. Undivided arolia shorter than smooth claws, subterminal seta smooth and curved.

MEASUREMENTS (length/width in mm): total length 4.0-4.4; cephalothorax 1.36-1.49/1.34-1.52(♂) (♀: 1.33-1.34/1.56-1.62); pedipalps: Trochanter 0.79-1.03/0.53-0.62, femur 1.18-1.50/0.54-0.65, patella 1.31-1.53/0.60-0.65, hand with pedicel 1.20-1.50/0.79-1.07, length of movable finger 1.21-1.52, of chela with pedicel 2.31-2.96; leg I: femur 0.41-0.49/0.25-0.30, patella 0.69-0.80/0.22-0.26, tibia 0.71-0.79/0.14-0.19, tarsus 0.51-0.60/0.11-0.14; leg IV: Femur+patella 1.24-1.51/0.29-0.33, tibia 1.06-1.25/0.18-0.23, tarsus 0.66-0.75/0.13-0.16.

ETYMOLOGY: A Latin adjective, meaning "possessing a protuberance", referring to the protuberance of the patella in males.

DISCUSSION: *Megachernes tuberosus* sp.n. is easily distinguished from *M. glandulosus* sp. n. by its more slender palpal femur (2.2-2.4 times vs 1.85 times), the much more slender palpal hand and by its shape, the non-gaping chelal fingers and the basal position of trichobothrium *ist* which is near *ib* (in *glandulosus ist* is placed in the middle of the finger, near *isb*). It shares with *M. barbatus* (from Vietnam) the "fur-like" setation on palpal segments (in both sexes) and similar palpal proportions, but differs by the presence of a protuberance on the male palpal patella, by its smaller size (e.g. palpal femur length max. 1.50 mm vs 1.72 mm min.), by the non-gaping chelal fingers and the basal position of *ist*, nearly at level of *esh*).

Megachernes sp.

MATERIAL EXAMINED: China, Sichuan, Xin Long, without collecting data, VIII.1995 (AKL 95.13): 1 tritonymph.

Nudochernes troglobius sp. n.

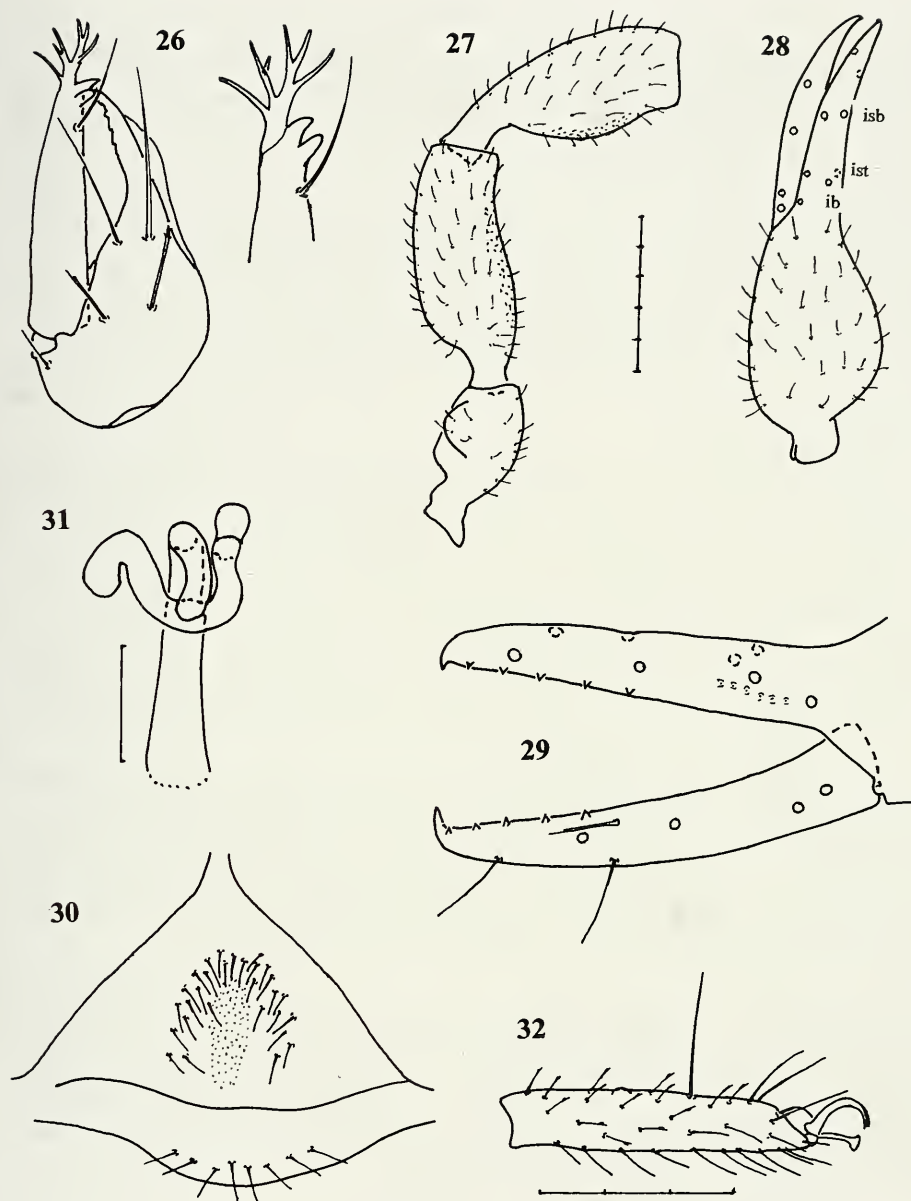
Figs 26-32

Pseudoscorpions. – Lips, 2006: photo, p. 108.

MATERIAL EXAMINED: China, Hubei, Banqiao, Grotte du Dauphin (Dolphin Cave), 30°32.606N/109°16.815 E, alt. 1489 m, 8.10. 2006, leg. J. Lips (no. 2319): ♀ (holotype), 2♂ 5♀ 1 tritonymph (paratypes). – Sichuan, Xin Long, grotte de Gan Shuan, 30°38.96N/109°19.23 E, 6.8.1999, leg. J. Lips (no. 429): 2♀ (paratypes). – Sichuan, Xin Long, without collecting data (AKL 95.2): 2♀ (paratypes).

DIAGNOSIS: A species characterized by its short and dentate vestitural setae, its spermatheca with a long median tube and two apical short branches, stout pedipalps (e.g. femur 2.4-2.9 times, patella 2.4-2.8 times), small size (e.g. length of palpal femur 0.63-0.81mm, length of chela 1.35), and by the presence a dentate pseudotactile seta on tarsus IV.

DESCRIPTION: Pedipalps and cephalothorax reddish brown (basal half lighter than reddish distal half), tergites and sternites yellowish. Cephalothorax normally as long as broad (0.92-0.97 times), densely granulate, with two granulate transverse furrows, the subbasal one slightly nearer to posterior margin than to median furrow, an narrow longitudinal shallow groove in metazone, no eyes or eyespots; 10-12 setae at anterior and 14-17 (+ 0-5 submarginal) at posterior margin; setae of cephalothorax and tergites indistinctly clavate and apically dentate; tergites I-X divided, chaetotaxy of half-tergites: 6-9 marginal setae, one lateral and one median anterior seta, XI with a total of 7-10 (2 tactile setae, 2 elongate median discal setae). Manducatory process



FIGS 26-32

Nudochernes troglobius sp. n., ♀ holotype (26-32). (26) Left chelicera, with details of end of movable finger. (27-28) Left pedipalp, setae on chelal fingers (28) omitted. (29) Trichobothrial pattern. (30) Genital operculum. (31) Spermatheca. (32). Tarsus of leg IV. Scale units 0.1mm.

with 3 marginal (1 microchaeta) and 2-4 discal setae; coxae of pedipalps granulate, with dense setation (1 tactile seta, distal ones apically crown-like dentate), coxae I about 20, II 20, III about 30 setae, IV numerous setae, longer at posterior margin; anterior genital operculum (Fig. 30) with 20-30 setae (in semi-circular arrangement), male genital opening with 2-4 acute inner microchaetae, spermatheca (Fig. 31) with a long unpaired tube and two short apical tubules; sternites divided, scaly sculptured, setae finely dentate (particularly on posterior sternites) and long, chaetotaxy: 11-14 (δ : marginal and discal setae)(4(\varnothing))+4 suprastigmatic microchaetae - 6(δ)(3-5(\varnothing))+4, following ones with 8-10 marginal setae, 1 lateral and 1 median anterior seta, XI with total of 9-11 (4 tactile setae). Pleural membranes striate. Chelicera (Fig. 26): 5 setae on hand, *db* and *ib* dentate, fixed finger with 5 retrorse teeth and 2-3 subapical granules, movable finger with a long cone-like subapical lobe, spinneret (Fig. 26) with 6 long branchelets in distal part, serrula exterior with 20-22 lamellae, rallum with three, apically dentate blades.

Pedipalp (Figs 27-29): Most segments finely granulate; trochanter with distinct rounded dorsal hump, 1.9-2.1 times longer than broad, femur 2.4-2.9 times longer than broad, patella 2.4-2.8 times, club 1.7-1.9 times longer than broad, hand indistinctly granulate medio-distally, with pedicel 1.8-1.95 times longer than broad and 1.0-1.07 times longer than finger, chela with pedicel 3.4-3.8 times longer than broad; fixed finger granulate in basal half, with a small dorsal depression distal of *isb*, with 44-51 cusped teeth, 5-6 lateral and 3-4 medial accessory teeth, movable finger with 46-52 cusped teeth, 5-7 lateral and 2-5 medial accessory teeth; nodus ramosus closer to *t* than to *st*. Trichobothrial pattern as in Fig. 29: *est* halfway between *et* and *esb*, *isb* distal to *est*, *ist-ib-esb* grouped at base of finger.

Leg I: Femur 1.5-1.6 times longer than deep, patella 2.7-3.1 times longer than deep and 1.6 times longer than femur, tibia 3.4-4.35 times, tarsus 4.7-5.0 times longer than deep. Leg IV (Fig. 21): Femur+patella 4.0-4.5 times, tibia 5.1-5.6 times, tarsus 4.5-5.0 times longer than deep, an acute tactile setae near middle of tarsus (TS = 0.48-0.61) and distinctly longer than width of tarsus; arolia undivided, slightly shorter than the smooth and large claws, subterminal seta smooth and curved.

MEASUREMENTS (length/width, in mm): Total length 2.1-3.3; cephalothorax 0.74-0.82/0.69-0.87. Pedipalp: Trochanter 0.42-0.51/0.22-0.24, femur 0.63-0.81/0.21-0.29, patella 0.61-0.78/0.24-0.30, hand with pedicel 0.58-0.72/0.30-0.40, length of finger 0.58-0.72, length of chela with pedicel 1.13-1.35. Leg I: Femur 0.21-0.25/0.13-0.16, patella 0.33-0.40/0.11-0.14, tibia 0.31-0.42/0.08-0.10, tarsus 0.32-0.38/0.07-0.08; leg IV: Femur+patella 0.61-0.78/0.14-0.17, tibia 0.46-0.62/0.09-0.11, tarsus 0.36-0.45/0.08-0.09, length of tactile seta 0.11-0.17.

ETYMOLOGY: Latin, meaning cave inhabiting.

DISCUSSION: One species of the genus *Nudochernes* (*lipsae* Mahnert 2003) has recently been described from the Da Hei Dong cave (Yunnan Province), *troglobius* sp.n. differs from it in having slightly stouter pedipalps (e.g. femur 2.4-2.9 times vs 3.2 times, patella 2.4-2.8 times vs 3.0 times) and being smaller in size (e.g. length of palpal femur 0.63-0.81mm vs 0.91mm, length of chela 1.35 vs 1.53mm). Furthermore, *N. lipsae* possesses a dentate pseudotactile seta on tarsus IV, whereas in *troglobius* sp.n. this seta is longer and acute.

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